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THE ORIENTAL FRUIT MOTH

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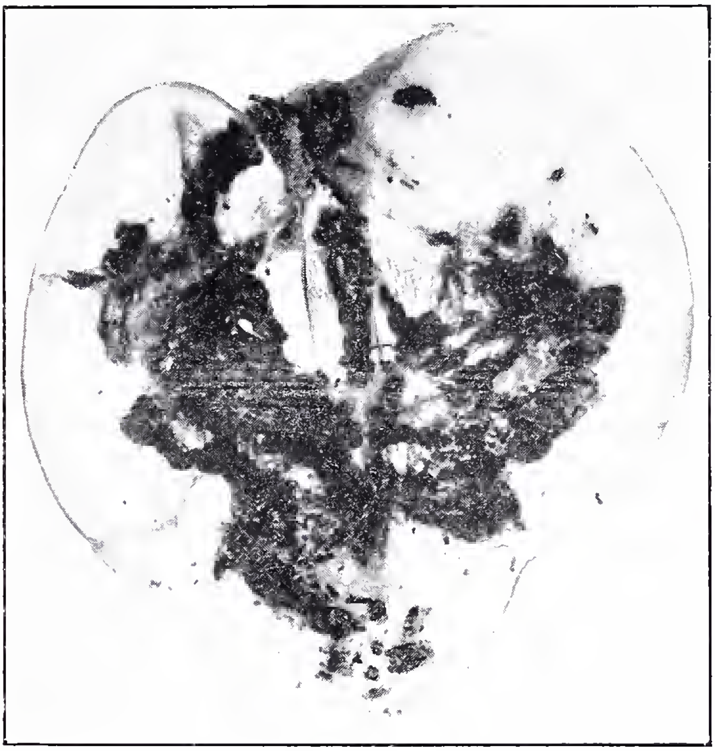
Bureau of Plant Industry



Quince Showing Larval or "Worm" Injury

F. P. Willits, Secretary of Agriculture
C. H. Hadley, Director, Bureau of Plant Industry

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SUMMARY

The Oriental fruit moth is one of the most dangerous orchard pests of to-day. It was first reported in harmful numbers in Pennsylvania 1923 when it caused heavy losses in orchards of the southeastern section of the State.

By the end of the 1924 season the insect was known to be present in Franklin, Adams, York, Chester, Delaware, Philadelphia, Montgomery, Bucks, Berks, Lebanon, Dauphin, Lancaster, Cumberland, Perry, Northumberland and Schuylkill Counties.

The damage to the fruit industry is caused in two ways: First, the larvae feed in the young shoots of the peach tree killing them back and causing them to take on a bushy growth; and second, the larvae feed in the fruit of peach, quince and apple causing a wormy product which is never evident from the exterior.

At present there is no satisfactory control for the moth. The following sprays are recommended as giving partial control sufficient to warrant their use: Nicotine sulfate containing forty per cent nicotine used at the rate of one to eight hundred is the killing agent, and it should be added to the usual peach sprays, as follows:

1. Petal Fall Spray. When nearly all the petals have fallen.
2. Shuck Fall Spray: At about the time when the greater part of the shucks have fallen. This usually is about ten days after the petal fall.
3. Again in about two weeks after the shuck fall spray.
4. For varieties ripening before and at the same time as Elberta another spray of nicotine should be made about three weeks before ripening time. Later varieties probably should have one or two more applications of nicotine.

Small quince plantings are perfectly protected by enclosing the fruits in tough paper bags.

THE ORIENTAL FRUIT MOTH.

By T. L. Guyton and A. B. Champlain

Bureau of Plant Industry.*

OCCURRENCE AND SPREAD

The Oriental fruit moth (*Laspeyresia molesta* Busck.) made its appearance in the United States in the vicinity of the District of Columbia some time prior to 1916. It is supposed to have been introduced into the country from Japan on nursery shipments of flowering cherry, peach and other trees.

The year 1923 marked the first appearance of this new pest in Pennsylvania in numbers great enough to cause commercial loss to fruit growers. Up to the present time the Oriental fruit moth has been found in Franklin, Adams, York, Chester, Delaware, Philadelphia, Montgomery, Bucks, Berks, Lebanon, Dauphin, Lancaster, Cumberland, Perry, Northumberland and Schuylkill Counties.

It is undoubtedly present in many other counties of the state, and must be considered as one of the outstanding orchard pests of the day.

CHARACTER AND EXTENT OF INJURY

The early generations of larvae or worms bore into the growing tips of peach, killing them back for several inches (See plate I figures 1, 2, and 3.). However, in orchards with slight twig growth some of the larvae of this first generation will feed in the very young fruit. Later generations attack both twigs and fruit. The killing back of the terminals cause the tree to send out many lateral shoots resulting in a very bushy top. In most infested orchards under observation practically all the terminals had been injured by the boring habits of the larvae, and the percentage of fruit infestation ran as high as seventy-five percent.

Wormy peaches are not always easy to detect as the young larvae may enter the peach near or through the stem; especially is this true of ripe fruit. Gum and frass are usually exuded from the entrance holes in green fruit, a condition identifying the work of this insect, (See plate I figure 4).

Not only are peaches favored as food by the Oriental fruit moth, but quinces and apples are also attacked. Quinces are completely destroyed by feeding larvae, (See cover plate) although the surface of the quince may show little evidence of the ruin interior, usually the only external evidence in this case is the presence of rather clean holes about the size of a match stem leading from open galleries inside.

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*Credit is due to H. B. Kirk, Bureau of Plant Industry, for assistance in the field and for the photographic illustrations.

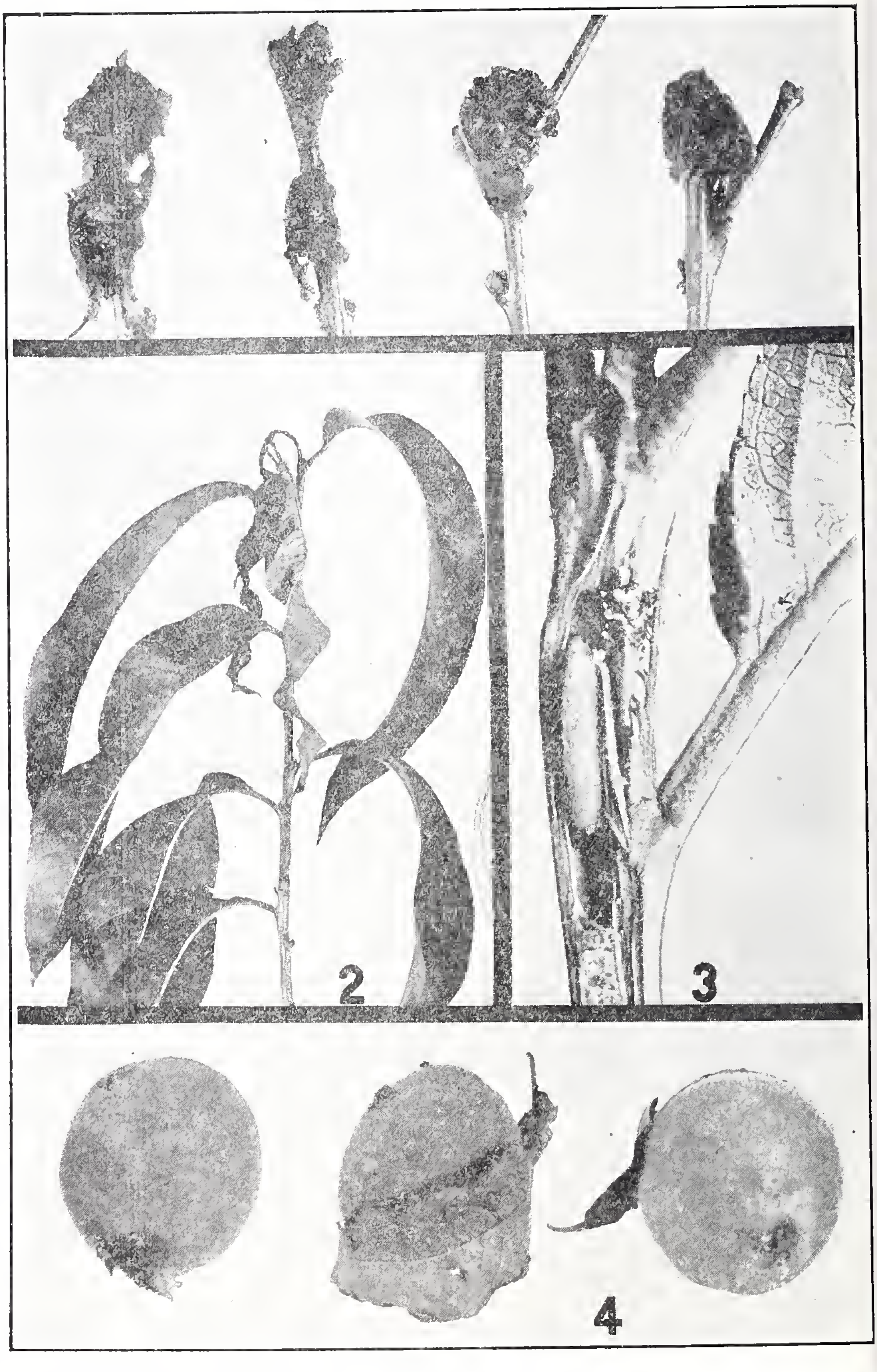

PLATE I: Fig. 1—Typical appearance of injured twigs after leaves have fallen.
Fig. 2—Terminal or shoot injury by the larva or "worm"
Fig. 3—Same greatly enlarged, showing interior of shoot with larva in its burrow. (After Quaintance and Wood, Jour. Agr Res. VII, No. 8, 1916.

SEASONAL AND LIFE HISTORY.

The Oriental fruit moth overwinters in the larval or worm stage in slight coccoons, composed of particles of bark, frass and dirt in addition to the silk which holds this matter together. They are found in the drier situations on the trunks of the trees, beneath loose bark, (See plate II) in cracks and crevices on the bark, in tight crotches, in old borer holes, in mummied fruit on the trees, in curls of peach bark and rarely on bark in exposed places. They may also be found on other trees, on fence posts and in weed stems but not in numbers comparable to those found on tree trunks.

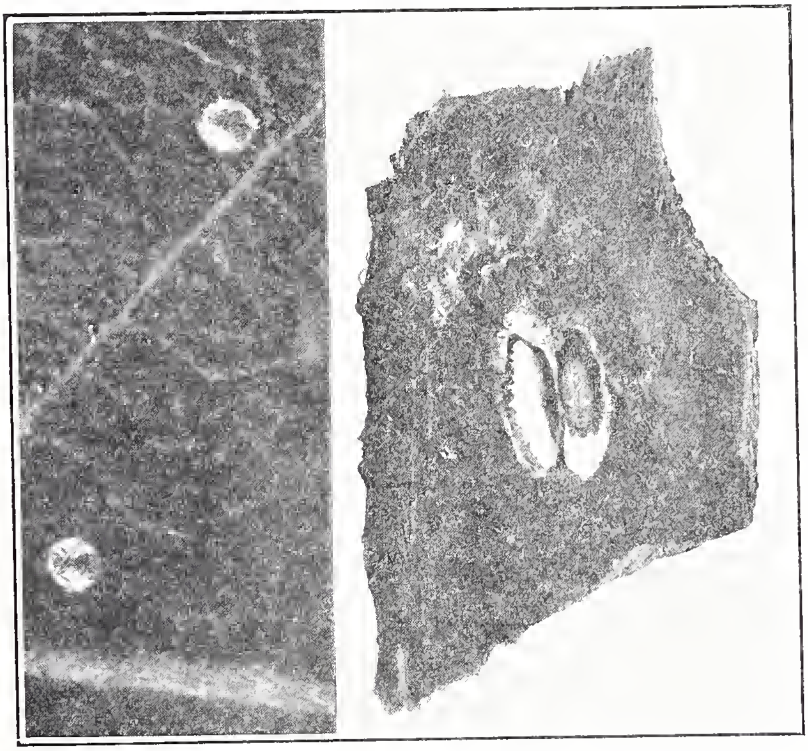

PLATE II: Left—Eggs on under side of peach leaf (greatly enlarged).
Right—Overwintering larva and newly formed pupa in cocoons on the under surface of quince bark.

Transformation to the pupal stage takes place in early spring, April 8th at Harrisburg being our first observation. This is the time of the first showing of pink in the peach buds and the first opening of quince buds.

Maximum spring pupation appears to be from April 15th to 20th and within a week or so the adults fly—about the time the peach blossoms are half out and the quince leaves unfolding.

The deposition of eggs began in early May and continued until late in the fall. They are usually deposited on the underside of the leaves in the case of peach, although some eggs are found upon the upper surface. In the case of quince they are always found upon the upper side on account of the hairy surface beneath. Eggs are also deposited on the persistent calyx of the quince fruit and on the stems of new shoots.

The Eggs.

The eggs are about the size of a pinhead, transparent when empty or translucent and iridescent before hatching. They are circular in outline, scale-like, somewhat convex and with flattened edges. The center is whitish or grayish with a slight polish. They hatch in from four to ten days, (See plate II).

The Larvae.

In general appearance the larvae or worms resemble the codling moth larvae, but are somewhat smaller, measuring about one-half inch in length when full grown. They vary in color during the different stages of development, the younger larvae are a dirty cream color, varying to pink, which is intensified as they grow older, (See plate III).

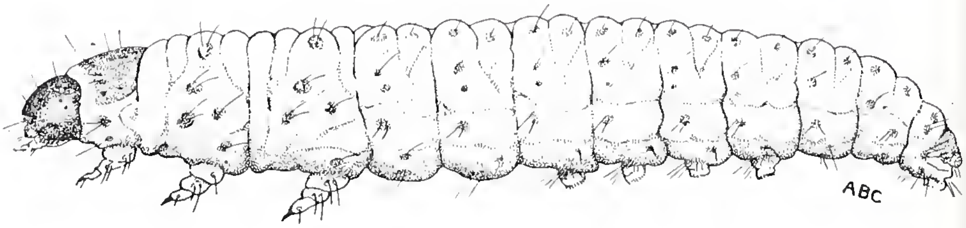

PLATE III: The larva of the Oriental Fruit Moth (greatly enlarged).

Upon hatching the young larvae immediately start out to find favorable feeding places in the terminals or fruit. The length of time required for the larvae to develop fully is from eight to sixteen days, depending on weather conditions.

The first two generations of larvae (there are four altogether) feed mainly in the terminals of peach, cherry and quince. A part of the third generation larvae are found in the terminals but very few individuals of the remaining generation enter the twigs. In one orchard where the trees were old and the twig growth slight, many of the larvae of the first generation went into the small peaches.

Larvae of the remaining generations feed in fruit, mainly peach, quince, and apple, the latter usually being attacked in the ripening condition and after the harvesting of peaches.

The full grown larvae of the summer generations when leaving the fruit or stems to transform, prefer to form their cocoon on the sides or between the fruits, where they utilize the fuzz or hairs on the fruit together with their silk in making cocoons. Fruit baskets and corrugated board covers are also favorite places for pupation. Larvae of the third and fourth generations coming from picked fruit are found in such places, and this no doubt constitutes a means of spread of the moth.

The Pupae

The pupae are yellowish brown in color, smooth, with an average length of one quarter of an inch. The pupal or quiescent period averages eight days, but may be more or less, (See plate II).

When the moth is ready to emerge the pupa pushes its way almost from the enclosing cocoon and attaches itself to the cocoon. The pupal case then splits and the moth emerges.

The Adult or Moth

The moth is somewhat smaller than the codling moth although resembling it in many respects. It has dusky brown mottled wings which are folded against the body when the moth is at rest. The wing spread is about 3/8 of an inch, (See plate IV).

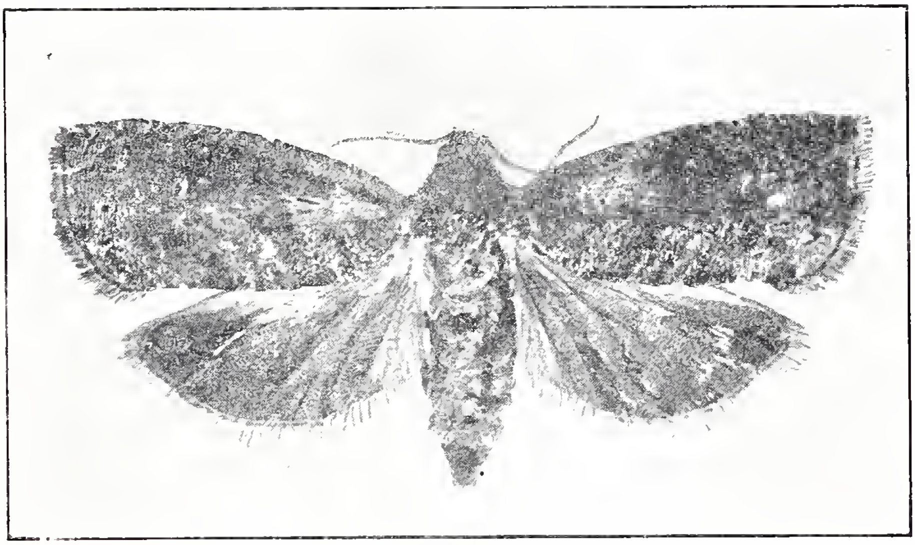

PLATE IV: Adult or Moth (greatly enlarged).

The outstanding observation in the behavior of the Oriental fruit moth during the season of 1924 was the flight of the moths during the middle of the day. This flight was observed on May 6th and was at its height between the hours of ten A. M., and twelve noon. The observations were made in the vicinity of Harrisburg in three widely separated orchards. Large numbers of the moths were seen flying about the trees, and numerous pairs were mating. The habit of daylight flying was noted several other times thruout the season, although at no later time was the number of moths nearly as many as in the first flight.

Number of Generations

From one year's observation in Pennsylvania with the Oriental fruit moth there appears to be about four generations. Early in the season the different generations are quite distinct but late in the summer the over-lapping is so pronounced that all stages may be found at one time.

METHODS OF CONTROL

At present there is no satisfactory method of control of the Oriental fruit moth. The fact that the larvae feed within the growing twig in the first and second generations makes it very difficult to apply control measures to these generations. Arsenicals seem to be of little or no value since it has been repeatedly observed that the larvae discard the particles of twig at their points of entrance, feeding only on the inner portions of the infested twigs.

Up to this time probably the most successful method of control is the use of nicotine sulfate containing forty percent nicotine as an ovicide, i. e., to kill the young larva within the egg before it hatches. This spray is made by adding the nicotine to the self-boiled lime-sulphur, or New Jersey "Dry Mix", at the rate of one part nicotine to eight hundred parts of spray solution. It seems from the brief studies made of the life history and behavior of this insect that three or four sprays with nicotine will be necessary to bring about an economic control of this pest. It is the opinion of the writers that the spray should be made at the following times:

1. Petal Fall Spray: When nearly all the petals have fallen.
2. Shuck Fall Spray: At about the time when the greater part of the shucks have fallen. This usually is about ten days after the petal fall.
3. Again in about two weeks after the shuck fall spray.
4. For varieties ripening before and at the same time as Elberta another spray of nicotine should be made about three weeks before ripening time. Later varieties probably should have one or two more applications of nicotine.

It has been reported that one grower in Pennsylvania was able to secure a commercial control by substituting a two percent nicotine dust for the sprays. This grower's aim was primarily to catch a height of emergence of the adult moths. This method of control will need further observations before it may be recommended.

In small plantings a measure of control may be secured by removal of the infested twigs in the early spring. For this method to be successful the injured twigs must be cut off soon after they are infested, since twigs which are completely killed, or badly wilted usually contain no larvae. The larvae have a habit of feeding in a twig for a time, and then leaving it to go to other twigs; hence as above stated, to make this method effective the twigs showing but slight wilting will be the ones which are most apt to contain the larvae, and they should be included in those removed. Twigs should be burned at once after removal.

Undoubtedly much could be done in the way of lessening the infestation in an orchard by gathering and destroying the fallen fruits before the larvae have left them. It is reported in New Jersey that cultivating the orchard in the late fall and early spring will aid in lessening the number of emerging larvae. Particularly, this seems true of orchards where a large number of infested fruits were allowed to remain on the ground from the previous season's crop. New Jersey investigators have also found that the number of moths emerging from trees which have received the paradichlorobenzene treatment for peach tree borers in all cases was less than those which had not received the treatment. Probably this treatment killed a number of the larvae which were in hibernation at or near the base of the tree.

From observations made in packing sheds it seems that large numbers of the larvae leave the fruit at packing time and go into hibernation in these buildings. Some means of destroying the moths which emerge from these larvae undoubtedly would be of assistance in lessening the number of those which go to infest the orchard in the spring. Undoubtedly this could be brought about by the prompt destruction of culled fruit. Observations were made in one packing shed where infested fruits were allowed to remain for some time in the shed thus allowing the larvae plenty of time to complete their growth, leave the fruit and spin their cocoons in and about the packing shed.

In small plantings of quinces the fruits may be successfully protected by covering them with paper bags. In the season of 1924 bags placed on quince in the first week of July gave perfect protection to the quince fruits while bags placed the second and third week of July enclosed fruits which contained larvae. These fruits were usually not reinfested, however, by a later generation. The bags used in covering the quinces must be tough enough to remain entire throughout the growing season. Further sanitary methods in the orchard, such as the removal and burning of dead branches of the trees, together with the scraping off of loose bark from about the trunks of older trees will undoubtedly do much toward reducing the number of moths in the spring in the first generation.